

Technical Memorandum

Significant Nutrient Point Sources and Nonpoint Sources in the Northern Coastal Bays System

EPA requires that Total Maximum Daily Load (TMDL) allocations account for all significant sources of each impairing pollutant. This technical memorandum identifies, in detail, the significant surface water discharges and significant nonpoint sources of nitrogen (TN) and phosphorus (TP) in the Northern Coastal Bays System and their distribution between different sub-basins of the system. Modeling input information is provided for simulating all potentially significant point sources as discrete discharges. These are conceptual values that are within the TMDL thresholds. They represent viable individual allocations to each point source. However, the Maryland Department of the Environment (MDE) expressly reserves the right to allocate the loads among different sources in any manner that is reasonably calculated to achieve water quality standards.

TMDLs are being established in the Northern Coastal Bays System watersheds for both low-flow and average annual conditions. The nonpoint source loads that were used in the model account for both “natural” and human-induced components. Low-flow nonpoint source loads were based on in-stream monitoring data.

The average annual nonpoint source loads were determined using land use loading coefficients. The land use information was based on 1997 Maryland Office of Planning data. The total nonpoint source load was calculated by summing all of the individual land use areas and multiplying by the corresponding land use loading coefficients. The baseline loading coefficients were based on a study conducted in the Maryland Coastal Bays (University of Maryland, 1993¹), with appropriate inclusion of urban loadings from Fenwick Island and the atmospheric deposition to the open water surface. The atmospheric deposition load was calculated by multiplying the surface area of each water quality model segment by a loading coefficient. The atmospheric loading coefficient was based on the results of the Chesapeake Bay Model², segment 430 (Pocomoke River), which was a continuous simulation model.

Table 1A and Table 1B provide point source modeling information for low-flow TMDLs for TN and TP respectively. This is supplemented by Table 1C, which provides additional information attributed to each point source for the low-flow TMDL calculations.

¹ University of Maryland Center for Environmental and Estuarine Studies, “Maryland’s Coastal Bays: An Assessment of Aquatic Ecosystems, Pollutant Loadings, and Management Options,” 1993.

² U.S. EPA Chesapeake Bay Program, “Chesapeake Bay Program: Watershed Model Application to Calculate Bay Nutrient Loadings: Final Findings and Recommendations,” and Appendices, 1996.

Table 1A
Loads Attributed to Significant Point Sources for
the Low-Flow Nitrogen TMDL^a

Source Name	Permit Number	TN Load <i>lb/month</i>	Flow <i>mgd</i>	Concentration <i>mg/l</i>
Ocean Pines Wastewater Treatment Plant	MD0020044	2,288	3	3
Perdue Farm Inc., Showell	MD0000965	1,525	1.2	5

Table 1B
Loads Attributed to Significant Point Sources for
the Low-Flow Phosphorus TMDL^a

Source Name	Permit Number	TP Load <i>lb/month</i>	Flow <i>mgd</i>	Concentration <i>mg/l</i>
Ocean Pines Wastewater Treatment Plant	MD0020044	1,525	3	2
Perdue Farm Inc., Showell	MD0000965	153	1.2	0.5

Table 1C
Additional Assumptions for Low Flow TMDLs^{a,b}

		Ocean Pine Wastewater Treatment plant	Perdue Farm Inc, Showell
CBOD	<i>kg/d</i>	284.3	75.8
DO	<i>kg/d</i>	56.9	27.3
NH₃	<i>kg/d</i>	6.82	9.1
ON	<i>kg/d</i>	13.65	6.82
NO₂3	<i>kg/d</i>	13.65	6.82
PO₄	<i>kg/d</i>	4.55	1.14
OP	<i>kg/d</i>	18.20	1.14
Flow	<i>m³/s</i>	0.1314	0.0527
Total Nitrogen	<i>kg/d</i>	56.9	
Total Phosphorus	<i>kg/d</i>	25	

Table 2A and Table 2B provide point source modeling information for average annual flow TMDLs for TN and TP respectively. This is supplemented by Table 2C, which provides additional information attributed to each point source for the average annual TMDL calculations.

^a These loadings correspond to Model Scenario 3 in the Draft TMDL *Total Maximum Daily Loads of Nitrogen and Phosphorus for Five Tidal Tributaries in the Northern Coastal Bays System, Worcester County, Maryland*, November 2001.

^b 1 Kg = 2.2 lb

Table 2A
Loads Attributed to Significant Point Sources for
Average Annual Nitrogen TMDLs^c

Source Name	Permit Number	TN Load <i>lb/month</i>	Flow <i>mgd</i>	Concentration <i>mg/l</i>
Ocean Pines Wastewater Treatment Plant	MD0020044	6,088	3	8
Perdue Farm Inc., Showell	MD0000965	2,437	1.2	8

Table 2B
Loads Attributed to Significant Point Sources for
Average Annual Phosphorus TMDLs^c

Source Name	Permit Number	TP Load <i>lb/month</i>	Flow <i>mgd</i>	Concentration <i>mg/l</i>
Ocean Pines Wastewater Treatment Plant	MD0020044	1,525	3	2
Perdue Farm Inc., Showell	MD0000965	153	1.2	0.5

Table 2C
Additional Assumptions for the Average Annual TMDL^{b, c}

		Ocean Pine Wastewater Treatment plant	Perdue Farm Inc, Showell
CBOD	<i>kg/d</i>	284.3	75.8
DO	<i>kg/d</i>	56.9	27.3
NH₃	<i>kg/d</i>	18.20	9.1
ON	<i>kg/d</i>	36.39	6.82
NO₂	<i>kg/d</i>	36.39	6.82
PO₄	<i>kg/d</i>	4.55	1.14
OP	<i>kg/d</i>	18.20	1.14
Flow	<i>m³/s</i>	0.1314	0.0527
Total Nitrogen	<i>kg/d</i>	113.7	
Total Phosphorus	<i>kg/d</i>	25	

The loadings, concentrations, and flows represented in the tables above are for illustrative purposes only. Actual effluent limits and related permit conditions will be established at the time of permit issuance or renewal and will be based upon conditions present at that time, as reflected

^b 1 Kg = 2.2 lb

^c These loadings correspond to Model Scenario 4 in the Draft TMDL *Total Maximum Daily Loads of Nitrogen and Phosphorus for Five Tidal Tributaries in the Northern Coastal Bays System, Worcester County, Maryland*, November 2001.

FINAL

in population projections, infrastructure needs as defined in County Comprehensive Water and Sewer Plans, and appropriate concentrations and loadings needed to address impairments of the water quality limited segments identified by this TMDL and the applicable 303(d) list. The total loads from all sources will, however, remain the same as the subtotals and grand totals reflected in the tables. Point source loadings, flows, and concentrations placed in permits will be based upon the information listed above as well as that provided during the permit adjudication process.

Table 3A and Table 3B provide one possible scenario for the distribution of average annual nitrogen and phosphorus nonpoint source loads between different sub-basins of the Northern Coastal Bays system respectively.

Table 3A
Nonpoint Source Nitrogen Loads
Attributed to Significant Sub-Basins for Average Annual TMDLs

Sub-basins of	Nonpoint Source (TN)	Nonpoint Source (TN)
Northern Coastal Bays System	TMDL Allocation	Baseline¹
	Load (lb/yr)	Load (lb/yr)
Turville Creek	23,645	37,374
Herring Creek	8,592	13,793
St. Martin River	141,453 ²	223,658 ²
Shingle Landing Prong	71,644	107,763
Bishopville Prong	61,699	92,689

Table 3B
Nonpoint Source Phosphorus Loads
Attributed to Significant Sub-Basins for Average Annual TMDLs

Sub-basins of	Nonpoint Source (TP)	Nonpoint Source (TP)
Northern Coastal Bays System	TMDL Allocation	Baseline¹
	Load (lb/yr)	Load (lb/yr)
Turville Creek	3,535	4,441
Herring Creek	1,111	1,396
St. Martin River	21,688 ²	23,744 ²
Shingle Landing Prong	10,541	13,728
Bishopville Prong	8,997	11,839

- ¹ The baseline NPS load is based on land use loading rates, described above, applied to 1997 land use estimates. It also includes direct atmospheric deposition to surface water and direct groundwater discharge.
- ² This includes loads from Shingle Landing Prong and Bishopville Prong, accounting for transport losses as the loads pass through the tributaries to St. Martin River.

It must be noted that these loads are based on broad-scaled estimates. Efforts will be undertaken in the future to obtain better estimates of the land uses and loading rates.